Water

P.E.I.'s MOST PRECIOUS RESOURCE

TRACADIE BAY COMPLEX

WATERSHED ACTIVITIES

SURFACE WATER PROGRAM

MARCH 1990

THE CANADA—PRINCE EDWARD ISLAND
WATER MANAGEMENT AGREEMENT

Environment Canada Environnement Canada

Prince Edward Island
Department of the Environment

TRACADIE BAY COMPLEX

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THE CANADA – PRINCE EDWARD ISLAND
WATER MANAGEMENT AGREEMENT

Prepared by:

Environment Canada
Inland Waters Directorate
Atlantic Region

P.E.I. Department of the Environment
Fish and Wildlife Branch

SURFACE WATER PROGRAM

MARCH 1990

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PREFACE

This report is one of a series produced as a result of the Canada - Prince Edward Island Water Management Agreement. The work was performed as part of the Watershed Inventory Project under the Surface Water Program.

It was initiated in order to gain a better understanding of the activities which may impact on the quality and quantity of surface waters drained by the Winter, Black and Trout Rivers into Tracadie Bay.

The report is intended to be used in conjunction with the report entitled "Activities Affecting Surface Water Resources · A General Overview" and the book of "Tracadie Bay Watershed Complex Inventory Maps" which is maintained on file at Inland Waters Directorate, Environment Canada in Dartmouth, Nova Scotia. All references to maps in this report are to the atlas.

Mapping was performed using the 1:50,000 N.T.S. topographical series using the Universal Transverse Mercator (U.T.M.) grid system to the nearest one hundred (100) metres for point data. Non-point (polygon) data is also mapped where applicable. This mapping technique is transferable to the Geographical Information System (G.I.S.) which can provide for updating and manipulation of the data.

ACKNOWLEDGEMENTS

The co-chairmen of the Surface Water Program Committee would like to thank the following people for their help on this project:

Bryan M. Pellerin, Personal Services Contractor, Inland Waters Directorate, Environment Canada;

T. Kent MacRae, Fish and Wildlife Branch, P.E.I. Department of the Environment;

Kelly Taylor, Personal Services Contractor, Inland Waters Directorate, Environment Canada; and

Alan P. Godfrey, Project Manager, P.E.I. Department of the Environment.

T. M. Humes
Federal Co-chairman

H. A. Smith
Provincial Co-chairman

TABLE OF CONTENTS

		Page
PREFACE		i
ACKNOWLEDGEMENTS		ii
TABLE OF CONTENTS		iii
LIST OF FIGURES		vi
LIST OF TABLES		vii
LIST OF MAPS		viii
LIST OF APPENDICES		ix
1.0	INTRODUCTION	1
2.0	GENERAL CHARACTERISTICS OF THE TRACADIE BAY WATERSHED COMPLEX	1
2.1	Description	1
2.2	Soils	4
3.0	AGRICULTURAL OPERATIONS	4
3.1	Dairy Operations	4
3.2	Beef Operations	4
3.3	Hog Operations	4
3.4	Stock Watering	4
3.5	Irrigation	6
3.6	Dead Stock Burial	6
3.7	Erosion Control Projects	6
4.0	FISH AND WILDLIFE RESOURCES	6
4.1	Angling Areas	6
4.2	Hunting Areas	7
4.3	Trapping Areas	7
4.4	Beaver Activity Areas	7
5.0	RECREATIONAL ACTIVITIES	8
5.1	Provincial Parks / National Park / Private Campgrounds	8
5.2	Swimming Areas	8
5.3	Boating / Canoeing Areas	9
5.4	Hiking / Cross-Country Skiing / Snowshoeing	9
5.5	Snowmobiling / Horseback Riding	9
5.6	Unplowed (Seasonal / Scenic Heritage) Roads	10

		Page
6.0	FISHERIES OPERATIONS	10
6.1	Licensed Commercial	11
6.2	Non-Licensed Commercial / Recreational	11
6.3	Aquaculture Operations	11
7.0	INDUSTRIAL OPERATIONS	12
7.1	Stormwater Drainage	12
7.2	Sewage Lagoons	12
7.3	Food and Beverage Processors	12
7.4	Abandoned, Active and Unapproved Dump Sites	12
7.5	Excavation Pits	13
7.6	Salt / Sand Storage Locations	14
7.7	Snow Disposal Sites	14
7.8	Additional Industrial Activities	14
8.0	ALTERATIONS OF NATURAL FEATURES OF WATERWAYS	14
8.1	Application Process and Requirements	14
8.2	Dam Inspections	15
8.3	Fishways	15
8.4	Road - Stream Intersections	16
8.5	Rail - Stream Intersections	16
9.0	WETLANDS	16
9.1	Freshwater Wetlands	17
9.2	Coastal Wetlands	17
9.3	Ducks Unlimited Canada Management Sites	17
10.0	ADDITIONAL ACTIVITIES WITHIN THE TRACADIE BAY WATERSHED COMPLEX	18
10.1	Hydrometric Stations / Water Chemistry Data	18
10.2	City of Charlottetown Water Supply	19
10.3	The Greater Charlottetown Environmental District Plan	20
10.4	Charlottetown Airport Expansion Study	20
11.0	ACTIVITIES AFFECTING SURFACE WATER RESOURCES WITHIN THE TRACADIE BAY WATERSHED COMPLEX	21
11.1	Sedimentation (Siltation) Sources	21
11.1.1	Trout River I	22
11.1.2	Trout River II	22
11.1.3	Winter River	22
11.2	Pollution Point Sources	22
11.3	Instream Obstructions	23
11.3.1	Brackley Pumping Station	23
11.3.2	Brackley	23

		Page
11.3.3	Suffolk Station	23
11.3.4	York I	23
11.3.5	York II	23
11.3.6	Covehead Road	24
11.3.7	Pleasant Grove	24
11.3.8	Jimmy Angus Cove	24
11.3.9	Black River	24
11.3.10	Pipers Creek	24
REFERENCES		25
APPENDIX		27

LIST OF FIGURES

Number	Title	Page
1.1	Tracadie Bay Watershed Complex	2
2.1	Physiographic Comparison Between Prince Edward Island and the Tracadie Bay Watershed Complex	3
3.1	Livestock Operations Located Within the Tracadie Bay Watershed Complex	5
6.1	1987 Fish/Shellfish Landings Within the Tracadie Bay Watershed Complex	10

LIST OF TABLES

Number	Title	Page
9.1	Ducks Unlimited Canada Management Sites Located Within The Tracadie Bay Watershed Complex	18
10.1	Land Use Characteristics Of Hydrometric Stations Located Within the Tracadie Bay Watershed Complex	19

LIST OF MAPS

Number	Title
Map 11L/6	Erosion Control Projects; Winter Bay Tent and Trailer Park; Whispering Pines Recreational Vehicle Park; Swimming Areas; Canoe Route; Silverside Fishing Area; Soft-Shelled Clam Harvest Area; Finfish Aquaculture Site; Officers Pond Sawmill; Fishways; Hydrometric Stations; Groundwater Well Fields; Charlottetown Airport; **Sedimentation (Siltation) Sources** -- Winter River; **Instream Obstructions** -- Brackley Pumping Station, Brackley, Suffolk Station, York I, York II, Covehead Road, Pleasant Grove and Jimmy Angus Cove.
Map 11L/7	Canoe Route; Fox Hill Landfill; **Sedimentation (Siltation) Source** -- Trout River I, Trout River II; **Instream Obstructions** -- Black River and Pipers Creek.
Maps 11L/6 and 11L/7	Major Livestock Operations; Angling, Hunting and Trapping Areas; Beaver Activity Areas; Unplowed Roads in Winter; Mussel Leases; Oyster Leases; Experimental Scallop Leases; Abandoned and Unapproved Dump Sites; Active Dump Site; Excavation Pits; Dam Locations; Major Road-Stream Intersections; Minor Road-Stream Intersections; Rail-Stream Intersections; 60+ Freshwater Wetlands; Coastal Wetlands and Ducks Unlimited Canada Management Sites.

LIST OF APPENDICES

Number	Title
A	Description of Dams Located Within the Tracadie Bay Watershed Complex

1.0 INTRODUCTION

In November 1987, the Canada - Prince Edward Island Water Management Agreement was signed. The Agreement focusses upon several areas including groundwater contamination, surface water degradation and estuarine eutrophication. Of these, the Watershed Inventory Project, as part of the Surface Water Program, has been designed to identify current and future users of surface water and to document resource conflicts within twelve watersheds across the province. The Tracadie Bay Watershed Complex (Figure 1.1) was identified as an area of study for the project.

2.0 GENERAL CHARACTERISTICS OF THE TRACADIE BAY WATERSHED COMPLEX

2.1 Description

The Tracadie Bay Watershed Complex is located in the north to northeast section of Queens County, P.E.I. The Winter, Trout and Black Rivers all empty into Tracadie Bay which, in turn, opens to the Gulf of St. Lawrence.

The several glaciers which at one time covered Prince Edward Island have caused a gently undulating terrain across much of the province. Average elevation is less than sixty-one (61) metres above sea level. The Tracadie Bay Watershed Complex encompasses a rolling section of the Island. The southwest section contains the steeper areas (46 metres) while the remainder is generally flatter with elevations ranging from seven to forty (40) metres.

The watershed is mostly rural with a few villages and farms scattered throughout. The southwestern section is being subjected to residential and industrial development due to its close proximity to Charlottetown. As is the case with the Island as a whole, the watershed is traversed by an extensive network of roads. Many of these roads are unpaved and are not kept open during the winter months.

A physiographic comparison of the watershed with the province (Figure 2.1) reveals that the watershed is more cleared than the provincial average (Taylor, 1989). This is due to the development of the southwestern sections of the watershed and the expanding use of the watershed as a recreational venue. The watershed drains a landbase of over one hundred and fifty square kilometres (150.63 km^2). The total length of the rivers and their tributaries is about

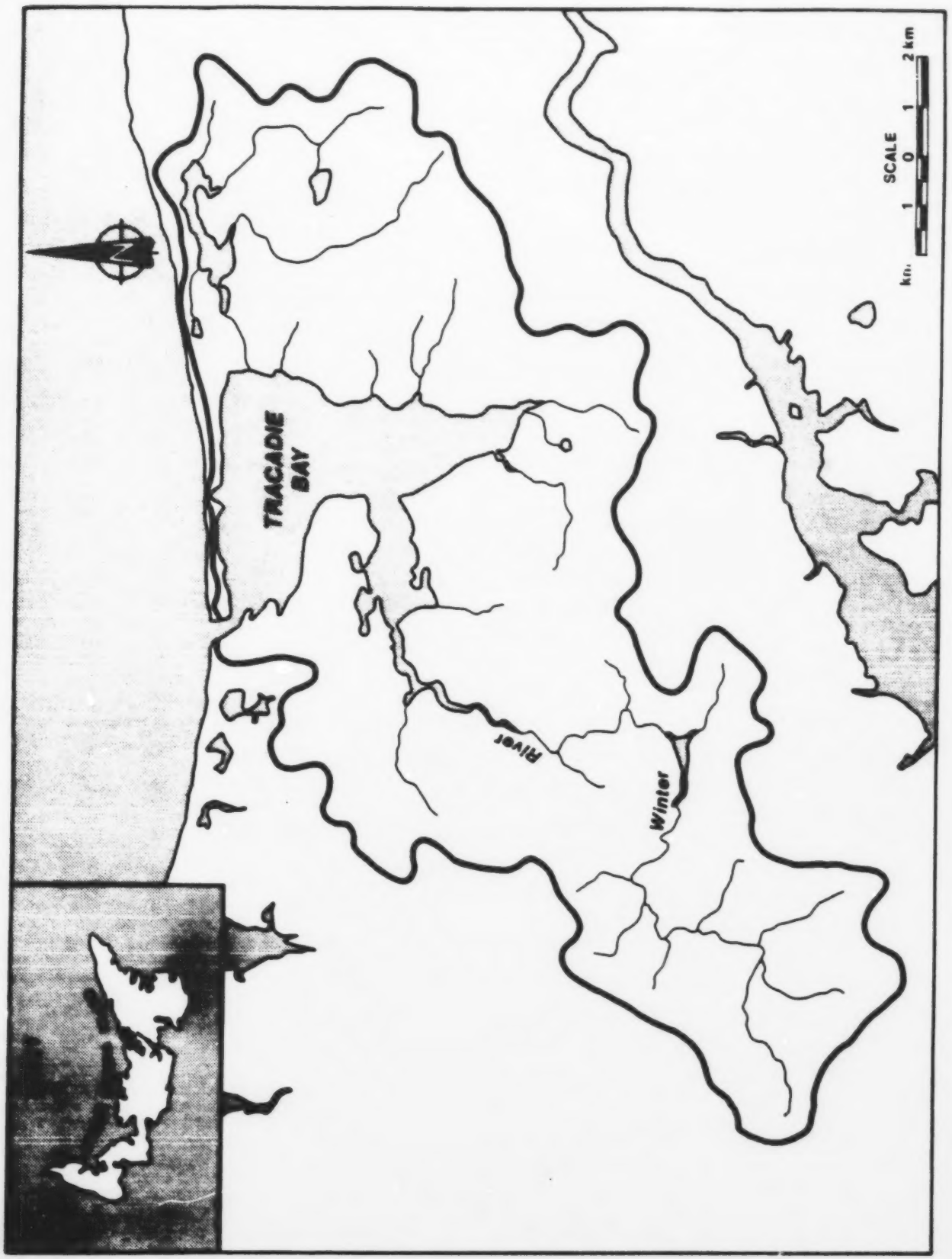

Figure 1.1 Tracadie Bay Watershed Complex

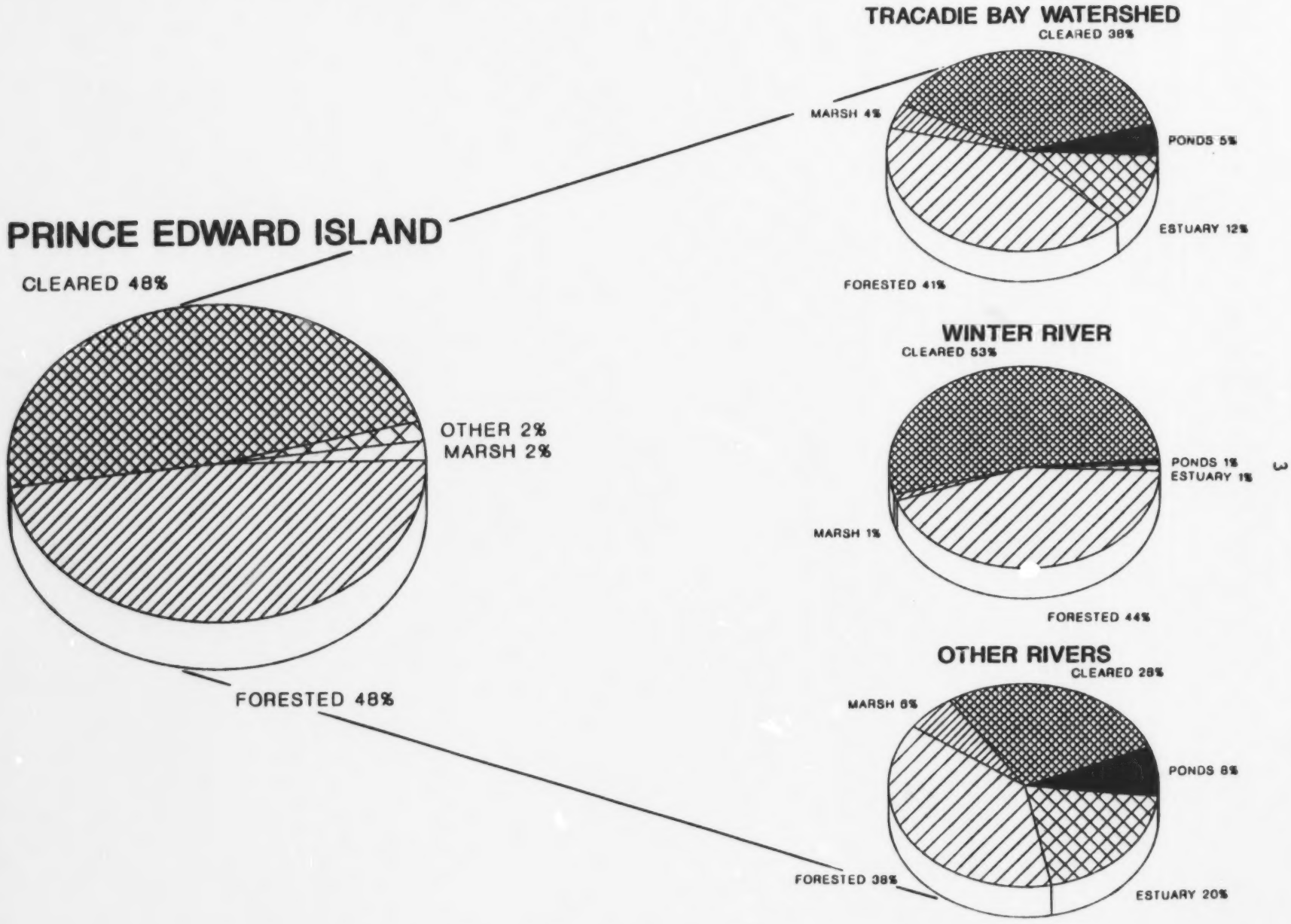

Figure 2.1 Physiographic Comparison Between Prince Edward Island and the Tracadie Bay Watershed Complex

ninety kilometres (91.55 km).

2.2 Soils

Prince Edward Island's podzol soils, formed mainly from the weathering of sandstone and the deposition of glacial till, are generally stone-free, sandy and permeable. The Tracadie Bay Watershed Complex is composed of varying amounts of Class 0, 2S, 3S, 3T, 4S, $4^{T}s$, 5S, $5^{S}w$, 7I, 7S and 7W soils. Approximately fifteen percent (15%) of the soils are Class 2, fifty percent (50%) Class 3, fifteen percent (15%) Class 4, ten percent (10%) Class 5 and ten percent (10%) Class 0 and Class 7 combined (Canada Land Inventory, 1968).

3.0 AGRICULTURAL OPERATIONS

Agriculture forms a major part of Prince Edward Island's economy. Most parts of the watershed's terrain are not well-suited for livestock operations. The northeastern section is mostly wooded and swampy. Seventeen (17) major livestock operations are located throughout the area (Maps 11L/6 and 11L/7). Crop production is also carried out on a limited scale with the major crops being potatoes, hay, oats, barley and clover.

3.1 Dairy Operations

There are eleven dairy operations in the Tracadie Bay Watershed Complex (Figure 3.1) each containing at thirty (30) or more head (30 milkers and 30 feeders) of cattle (Newson, 1989).

3.2 Beef Operations

Three beef cattle operations (Figure 3.1) with fifty (50) or more head (50 cattle plus 50 feeders) are present in the Tracadie Bay Watershed Complex (Murphy, S., 1989).

3.3 Hog Operations

There are also three hog operations (Figure 3.1) in the watershed. Each has an annual production of eight hundred (800) or more animals (Johnson, 1989). Since hogs are normally housed indoors the only threats to surface water quality are as a result of the improper storage and disposal of manure.

3.4 Stock Watering

Most livestock on Prince Edward Island are watered using

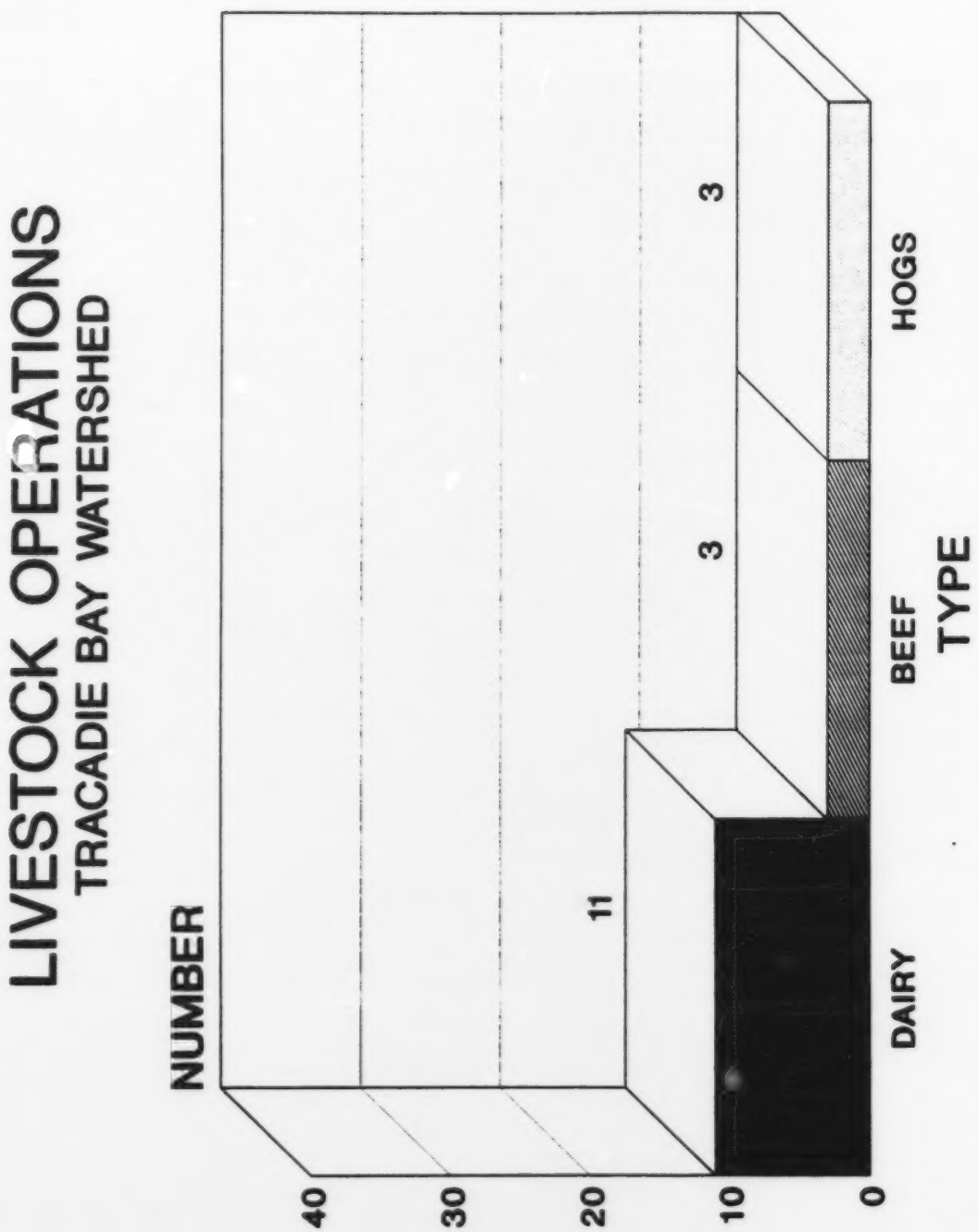

Figure 3.1 Livestock Operations Located Within the Tracadie Bay Watershed Complex

groundwater piped into troughs (Murphy, S., 1988). However, there have been some instances noted within the Tracadie Bay Watershed Complex in which animals were observed drinking from streams traversing the pastures (refer to Section 11.2). This leads not only to destabilization of the stream banks and siltation but also to bacterial contamination of the water.

3.5 Irrigation

The Prince Edward Island Department of Agriculture does not keep specific records on irrigation occurring within the province. Water used for irrigation generally comes from a surface water source such as a farm pond or stream. In unusually dry years there are more farmers than usual who have to irrigate their crops (Clough, 1988). Unless it is monitored, irrigation may affect the amount of water available for users in downstream locations.

3.6 Dead Stock Burial

There are not any dead stock burial sites located within the Tracadie Bay Watershed Complex. Farmers can either pay a service fee to have their stock discarded at an approved disposal site or they can sell their dead animals to Maritime Pet Foods both of which are outside of the watershed. They may also dispose of the carcasses on their own land (which is the most likely scenario).

3.7 Erosion Control Projects

Four erosion control projects are located in the Tracadie Bay Watershed Complex (Map 11L/6). Two are tile drainage projects while the others are land levelling and ditching projects (Pharo, 1989). The tile drainage projects have enabled farmers to increase the productivity of low class agricultural lands (DeHaan, 1989).

4.0 FISH AND WILDLIFE RESOURCES

Fish and wildlife resources are important to both residents and tourists alike on Prince Edward Island in terms of the recreational and economic benefits they provide. Fish and wildlife on P.E.I. are dependent upon surface water resources either for primary habitat or as a source of drinking water.

4.1 Angling Areas

There are numerous angling sites along the rivers (Maps

11L/6 and 11L/7) including two listed in Angling on Prince Edward Island (P.E.I. Department of Tourism and Parks, 1988). Hardys Pond and Corran Ban Bridge are good sites for angling rainbow and brook trout (MacIntyre, 1989). Officers Pond was initially established as private angling club for members of the Canadian Armed Forces. However, due to the declining number of active members, the club has been opened to all members of the public (Hurry, 1989).

4.2 Hunting Areas

The Tracadie Bay Watershed Complex is a fairly good area for hunting waterfowl. The open fields adjacent to Tracadie Bay and the several ponds and large areas of open water are excellent areas for hunting waterfowl (MacIntyre, 1989). The wooded areas and hedgerows separating agricultural fields provide habitat for such upland game species as; pheasant, snowshoe hare, ruffed grouse, Hungarian partridge, snipe and woodcock (Maps 11L/6 and 11L/7). Since wildlife is known to be migratory, in response to habitat requirements and food availability, their boundaries are not static from year-to-year.

4.3 Trapping Areas

As with hunting areas, the trapping areas located within the Tracadie Bay Watershed Complex (Maps 11L/6 and 11L/7) do not have consistent boundaries from year-to-year (MacIntyre, 1989). They are dependent both upon the movement of animals and the preferences of trappers. Species which are trapped include muskrat, beaver, mink, raccoon and snowshoe hare. The amount of trapping during the season is also dependent upon the fur market conditions.

4.4 Beaver Activity Areas

Beaver dams in streams and rivers result in the creation of flowages. These new areas provide habitat for waterfowl and other furbearing mammals such as mink and muskrat. The effects of beaver dams and the resulting flowages can also be viewed negatively as they often block the passage of trout, salmon and other finfish to essential spawning and feeding areas.

Beavers are limited to a few locations on the Black River (Maps 11L/6 and 11L/7).

5.0 RECREATIONAL ACTIVITIES

Surface water and some recreational activities go hand-in-hand (swimming and boating). Other activities (hiking and skiing) are often enjoyed in close proximity to streams and rivers. Similarly, major recreational facilities (provincial parks and private campgrounds) are generally situated adjacent to Island surface water resources.

5.1 Provincial Parks / National Park / Private Campgrounds

There are not any provincial parks in the watershed. Dalvay, a section of Prince Edward Island National Park, is located just outside of its northwestern boundary.

Winter Bay Tent and Trailer Park, located in Millcove (Map 11L/6), is a private campground on a three hectare (7 acre) site containing eighty-five (85) camp sites including several on the shores of Jimmy Angus Cove on Tracadie Bay. A laundromat, a sewage dumping station, flush toilets and shower facilities are available. Canoes and boats for use in Tracadie Bay can also be rented at the Campground (P.E.I. Department of Tourism and Parks, 1989).

Whispering Pines Recreational Vehicle Park (Map 11L/6) contains over one hundred (106) sites. Also included at the park are a sewage dumping area, ten flush toilets and six showers.

There are also several additional commercial accommodation's facilities located throughout the watershed including seven cottages, two bed and breakfast operations and one motel.

5.2 Swimming Areas

Generally, people will swim where they desire. In P.E.I. many of the best swimming areas are coastal. There are extensive sandy beaches located within P.E.I. National Park which is situated northwest of the watershed.

The only organized swimming activities on the Island occur through the Canadian Red Cross Society which does not, except on rare occassions, conduct swimming events in the Tracadie Bay area (MacLean, 1989). Hardys Pond, the old Tracadie Wharf and private cottage beachfronts would be the areas most concentrated with recreational swimmers (Map 11L/6).

5.3 Boating / Canoeing Areas

The Tracadie Bay Watershed Complex is a fairly good area for canoeing with several access points to both Tracadie Bay and Winter River. Blooming Point, Corran Ban Bridge, Tracadie Wharf and the old Tracadie Wharf are launching points within the watershed which have been identified by the Prince Edward Island Recreational Canoeing Association (P.E.I. Department of Tourism and Parks, n.d.). After accessing the Bay canoeists can enter the Winter River and paddle upstream for approximately three kilometres (Map 11L/6). Point Deroche Pond has a launching point near the Route #218 Bridge (Map 11L/7).

Larger boats are restricted to Tracadie Bay with access available at the Tracadie Wharf. Boardsailing is gaining popularity on P.E.I. Tracadie Bay is fairly sheltered and provides most of the windsurfing opportunities.

5.4 Hiking / Cross-Country Skiing / Snowshoeing

For the nature-buff or recreational enthusiast, a good method in which to see an area is on foot, either by hiking, cross-country skiing or snowshoeing. In this way, people can go at their own pace, perhaps photographing what catches their eye or just enjoying the great outdoors.

There are no organized hiking or cross-country trails although the rail lines which wind their way in and out of the watershed and the several unpaved and woods' roads are well-suited for this purpose.

Snowshoeing may be undertaken anywhere within the watershed although the areas utilized for hiking and cross-country skiing most likely have the highest use for snowshoers.

5.5 Snowmobiling / Horseback Riding

There are no snowmobiling clubs located within the Tracadie Bay Watershed Complex and therefore, no organized excursions. Snowmobilers are most often seen riding through fields and woods' and seasonal roads.

There are not any commercial horseback riding operations located within the Tracadie Bay Watershed Complex. However, horses have been observed in at least one pasture and it is assumed that trail riding does occur on a limited scale.

5.6 Unplowed (Seasonal / Scenic Heritage) Roads

Many local and unpaved roads in the watershed are not open for vehicular traffic during the winter months (Maps 11L/6 and 11L/7). Their relative abundance provides additional areas for winter recreational activities such as cross-country skiing, snowshoeing and snowmobiling. Often not well travelled, even during the warmer months, these roads may further supply recreational opportunities for hiking, cycling and horseback riding.

Several roads across the Island have been designated as Scenic Heritage Roads as a result of their natural and historical significance. There have not been any such designations within the Tracadie Bay Watershed Complex (Horne et. al., 1988).

6.0 FISHERIES OPERATIONS

The fishing industry is very important to the economy of Prince Edward Island. All of the province's major watersheds have an estuarial component thereby supporting a fishery to some extent. The value of the fish and shellfish species landed within the watershed during 1987 was over seventy thousand dollars ($70,465), (Figure 6.1). All finfish and shellfish harvesting can be placed into three general categories, namely; licensed commercial, non-licensed commercial and recreational and finfish aquaculture.

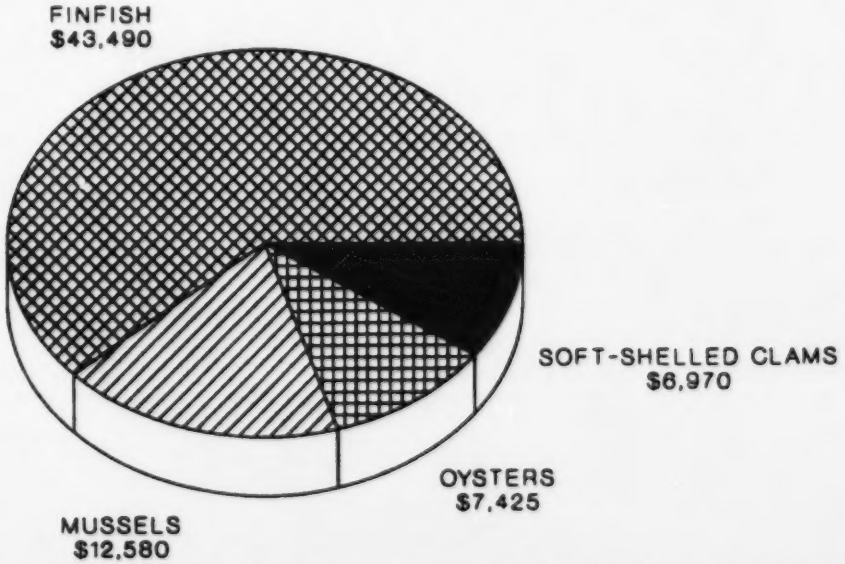

Figure 6.1 1987 Fish/Shellfish Landings Within the Tracadie Bay Watershed Complex

6.1 Licensed Commercial

Some areas of the Tracadie Bay Watershed Complex are classed as public fishing domain. As such, there are no suspended or ground shellfish leases and any fisherman can remove shellfish in season. Other areas are specific leased areas or zones and can be fished only by the lease owner. There are forty-three (43) mussel leases, three oyster leases and two experimental scallop farming leases in the watershed (Maps 11L/6 and 11L/7), (Small, 1989).

Eel fishing in the Winter River and Tracadie Bay constitutes the major licensed fishing activity within the Tracadie Bay Watershed Complex. There are three methods which are employed to fish eels. The traditional method is to use trap nets during the fall season (August to November). Newer methods include "flambeaux fishing". This involves the use of lights thus attracting the eels which are then speared. The flambeaux season extends from spring until fall. During the winter months holes are cut into the ice and spears are used to harvest the eels which are hibernating in the mud.

Smelts are fished commercially in about the same areas as the eels (October to March). Gill nets are used to catch the smelts after holes have been cut into the ice. Other fish caught in the watershed include silverside and gaspereau. Silverside fishing activity is concentrated mainly near the Corran Ban Bridge (Map 11L/6) while gaspereau are netted while migrating to upstream locations in the watershed.

6.2 Non-Licensed Commercial / Recreational

Trout and smelt are harvested in season by recreational fishermen. Soft-shelled clams are harvested near the Corran Ban Bridge (Map 11L/6).

There are not any shellfish closure areas in the Tracadie Bay Watershed Complex aside from the normally accepted one hundred (100) metres from public wharves. Shellfish may be harvested or grown on a commercial basis anywhere within the watershed.

6.3 Aquaculture Operations

There is one finfish aquaculture site. The outdoor tank facility near Pleasant Grove contains approximately one hundred thousand (100,000) rainbow trout and ten thousand (10,000) Atlantic salmon. Water is sourced from an unnamed stream at a rate of about eleven hundred (1100) litres per minute. Waste

produced at the site is not treated but is discharged directly into Currans Creek, a tributary of the Winter River (Map 11L/6). As mentioned previously, there are also a total of forty-eight (48) shellfish leases which are primarily used for aquaculture purposes (Murphy, L., 1989).

7.0 INDUSTRIAL OPERATIONS

Many of the industrial operations located on Prince Edward Island have an effect on surface water resources in one way or another. Some discharge both treated and untreated wastes directly into streams and rivers, while others allow for the seepage of pollutants to surface or groundwater sources. Some industrail operations require a surface water or groundwater source for use in their processes. The Tracadie Bay Watershed Complex is not developed as an industrial area. The main restriction which prohibits such development is the fact that the upper reaches of the Winter River is used as the primary source of drinking water for the City of Charlottetown and her surrounding area (refer to section 10.2).

7.1 Stormwater Drainage

There are not any areas that are built up to the extent that stormwater drainage systems are required to treat or handle rain or spring runoff (Fitzpatrick, Quick, Vessey, 1989).

7.2 Sewage Lagoons

There are not any sewage holding lagoons or treatment plants in the watershed. The relatively small size of the communities restricts the need for such facilities. All residential sewage is treated via private septic sytems (Fitzpatrick, Quick, Vessey, 1989).

7.3 Food and Beverage Processors

There are several potato and vegetable washing and packing operations located within the Tracadie Bay Watershed Complex but their effects on the quality and quantity of the surface waters are minimal.

7.4 Abandoned, Active and Unapproved Dump Sites

During 1982-83, the P.E.I. Department of Community and Cultural Affairs, in conjunction with Environment Canada, performed a study in which abandoned, active and unapproved

waste disposal sites on Prince Edward Island were located and inspected (Water Resources Section, 1983). Of prime concern during this inventory was the potential for groundwater contamination. Thirteen sites were identified within the Tracadie Bay Watershed Complex (Maps 11L/6 and 11L/7).

As part of the inventory a scoring system was used to rate and priorize (Priority I, II and III) each site on the basis of actual and potential environmental effects. Priority I sites were rated as being most hazardous to the environment; Priority II dumps were less hazardous; while Priority III sites were generally very small discriminate sites which were not considered to be environmentally hazardous. An evaluation revealed one Priority I, five Priority II and seven Priority III dumps.

The Air and Solid Wastes Branch of the P.E.I. Department of the Environment has identified one active approved dump site within the watershed. It is a landfill located near Fox Hill (Map 11L/7), (Curley, 1989).

There is no established program for hazardous waste disposal on Prince Edward Island (Curley, 1988). However, the Air and Solid Wastes Branch cooperates with their federal counterparts in controlling toxic waste disposal. For example, asbestos, which has been removed from buildings is double-bagged and dumped at landfill sites. Agricultural pesticides are sometimes left at dumpsites illegally. Since it is difficult to regulate such practices, remnant chemicals could become a potential hazard to both surface and groundwater resources.

The only other major form of toxic wastes on P.E.I. are polychlorinated biphenols (PCB's). As these compounds do not break down under normal conditions, they must be stored until they can be transported to a proper disposal site (located off-Island). There are no registered PCB users or PCB storage sites located within the Tracadie Bay Watershed Complex (Guardian - Patriot, 1988). Hazardous materials are not generated in significant amounts to threaten the quality of its surface water resources.

7.5 Excavation Pits

Scattered throughout Prince Edward Island are numerous excavation pits used for the private and commercial removal of sandstone, and to lesser amounts, gravel and sand. Eleven registered active excavation pits (Maps 11L/6 and 11L/7) are located in the watershed (Eaton, 1989). Records are not kept

concerning the quantity of material removed from the individual pits and there are other pits for which permits have not been obtained. As well, records are not maintained concerning the number of non-operational or abandoned pits (Murphy, C., 1988).

7.6 Salt / Sand Storage Locations

The P.E.I. Department of Transportation and Public Works maintains a number of salt/sand storage areas across the Island. At these temporary sites, the salt and sand is stored directly on the ground with little or no site preparation. Often, the locations of these secondary sites change thereby yielding both abandoned and active sites. There are not any active salt/sand storage sites in the area.

7.7 Snow Disposal Sites

Since the communities located within the Tracadie Bay Watershed Complex are fairly small snow removal from roads is performed by the P.E.I. Department of Transportation and Public Works or plow operators which have been contracted by the Department. Snow is usually pushed to the side of the road or into fields (Fitzpatrick, Quick, Vessey, 1989).

7.8 Additional Industrial Activities

A saw mill is operational at Officers Pond (Map 11L/6). The mill is not used on a regular basis but is still active. Sawmill waste can increase the biological oxygen demand of waterways and, in some cases, cause increases in the acidity of the water (Godfrey, 1989).

8.0 ALTERATIONS OF NATURAL FEATURES OF WATERWAYS

Individuals or groups wishing to alter a water system directly or indirectly to improve its recreational potential, provide a reservoir for agricultural purposes or fire protection or construct a stream crossing must seek approval from the Water Resources Branch of the P.E.I. Department of the Environment (Environmental Protection Act, Sections 10 and 11).

8.1 Application Process and Requirements

Alteration applications are subject to government control under the P.E.I. Environmental Protection Act (Section 10) and the Canada Fisheries Act (Chapter F-14, Section 20). Before requests are given final approval by the Head of the Watercourse Alteration Advisory Committee, they

are reviewed by several Federal/Provincial Government and private agencies. Once approval is granted, inspections are carried out to ensure that the recommendations of the Committee are being followed.

Application considerations include the following criteria: the well-being of the fisheries resource; possible changes in water quality; stream-side cutting leading to loss of essential food and cover for wildlife; and the effects of the alteration on other types of wildlife.

Types of alterations include; installation of dams and/or fishways, bypass pond construction, roadway culvert installation, rock gabion installation and the infilling of marshes. Infilling applications, most often, are rejected since the practice results in a loss of wildlife habitat.

Since P.E.I. soils are highly susceptible to erosion, proponents who alter waterways must undertake erosion control measures throughout the construction process.

8.2 Dam Inspections

The twelve dams located in the watershed (Maps 11L/6 and 11L/7) were inspected during the Watershed Inventory Project. Four were found to constitute a total barrier to fish passage due to a variety of reasons including the design of the dams, debris within the waterways or lack of water flowing through the culverts (refer to Section 11.3). Some of the structures, upon inspection, were thought to be inappropriate for the amount of water in the waterway.

There are, in some cases, repairs made to design flaws of roadway culverts which permit the passage of fish through the structures. This involves the installation of baffles or back flow devices which then allows for decreased water velocity and increased depth within the culverts. There are not any examples of this in the watershed although it would be appropriate in several cases.

8.3 Fishways

On Prince Edward Island, whenever an alteration is made to a waterway, the continued passage of fish must be ensured [Canada Fisheries Act, Chapter F-14, Section 20, (1)]. This involves, in some cases, the construction of a fishway. Various fishway designs are available with the type constructed dependent upon the species of fish to be passed and the water level fluctuations within the impoundment.

Three fishways were identified and field checked in the watershed (Map 11L/6). Two are pool-and-weir {Officers Pond (9-step) and Hardys Pond (5-step)} while the other, located at Brackley Wells Pumping Station, is a modified one-step Denil. There is also a hydrometric station located at the latter site.

8.4 Road - Stream Intersections

The P.E.I. Department of Transportation and Public Works maintains a reference map which provides an up-to-date record of all major highway structures, that is, those over 1.2 metres in diameter, within the province. The Tracadie Bay Watershed Complex contains thirteen such structures (Maps 11L/6 and 11L/7).

The Watershed Inventory Project also identified fifteen additional road-stream intersections which, due to their smaller size, are not kept on file at the Department of Transportation and Public Works (Maps 11L/6 and 11L/7). These areas were located via 1:50,000 N.T.S. maps.

8.5 Rail - Stream Intersections

Earlier this century, railroads on Prince Edward Island were a vital component in the transportation of goods across the Island. However, due to increased rail costs and more efficient trucking methods, its importance is rapidly decreasing. Therefore, all rail lines across the province were abandoned effective January 1990.

After a line is abandoned, CN Real Estate contracts out for the removal of the ties and rails. Crossing structures are not usually removed since they are often more useful if left in place.

There are five major railway-stream intersections (Maps 11L/6 and 11L/7) within the watershed. These must continue to be regularly inspected and maintained so that there are not any problems with fish passage through the structures.

9.0 WETLANDS

Wetlands include salt marshes, intertidal flats, bogs, freshwater marshes, swamps and ponds. They are important for many reasons (Canadian Wildlife Service, n.d.):

1. as wildlife habitat;
2. act as natural filters;

3. bind pollutants thereby slowing the eutrophication process;
4. reduce flooding by acting as reservoirs; and
5. recharge the groundwater supplies.

During 1983 - 84 any wetlands over 0.25 hectares on Prince Edward Island were inventoried. The objective of the program was to provide information on the classification, size, distribution and wildlife value of P.E.I. wetlands.

9.1 Freshwater Wetlands

All freshwater wetlands within Prince Edward Island were identified during the wetland inventory and were given a wildlife value based on a wide array of parameters. The wetlands received a score between 36 and 108 with a score of 60+ indicating generally more productive areas.

Fifteen freshwater wetlands with a score of 60+ were delineated in the watershed (Maps 11L/6 and 11L/7), (Canadian Wildlife Service, n.d.).

9.2 Coastal Wetlands

Coastal wetlands were classified and scored as coastal units during the wetland inventory. The coastal unit score was calculated using the total of the scores from six component types of wetlands along with five additional factors. Added to that was a value for the disturbance status of the unit. The total coastal unit score indicated its productivity and provides a measure of its importance to wildlife. The scores ranged from 10 to 1500 points and were indicated as the sum of all wetlands within the unit.

There are fifteen wetlands in the Tracadie Bay Watershed Complex which can be classified as coastal units (Maps 11L/6 and 11L/7), (Canadian Wildlife Service, n.d.).

9.3 Ducks Unlimited Canada Management Sites

Ducks Unlimited Canada is active on Prince Edward Island in the enhancement and management of wildlife habitat. Several management techniques are employed for this purpose. Installation of water control devices such as drop inlets and stoplog control structures allow for the creation of ponds and the regulation of water levels in order to maintain optimal habitat conditions. Fishways are usually installed with the water level control structures in order to allow for the continued passage of fish into and out of the

impoundment.

There are three active Ducks Unlimited sites (Table 9.1), (Maps 11L/6 and 11L/7) within the Tracadie Bay Watershed Complex (Dibblee, 1989).

Table 9.1 Ducks Unlimited Canada Management Sites Located Within The Tracadie Bay Watershed Complex

NAME	SIZE (HA)	SHORELINE (KM)	YEAR COMPLETED
Hardys Pond	14.17	3.5	1976
Officers Pond	50.60	4.3	1984
Little Deroche Pond	25.10	2.4	1984

10.0 ADDITIONAL ACTIVITIES WITHIN THE TRACADIE BAY WATERSHED COMPLEX

10.1 Hydrometric Stations / Water Chemistry Data

The first streamflow data collected in Prince Edward Island was from the Dunk River at Rogers Mill between 1919 and 1935. There are two stations located within the Tracadie Bay Watershed Complex for which data to 1986 is available (Map 11L/6). Both are located on the Winter River at Suffolk (NAQUADAT No. 01CC002) and at Brackley Wells Pumping Station (NAQUADAT No. 01CC003).

Land use characteristics for the basins draining to each of these stations have been determined by Inland Waters Directorate, Environment Canada, Dartmouth, Nova Scotia and appear in Table 10.1. Together they drain an area of 41.10 square kilometres.

Table 10.1 Land Use Characteristics Of Hydrometric Stations Located Within the Tracadie Bay Watershed Complex

Station Number	Drainage Area (km^2)	Forest Area (km^2)	Cleared Area (km^2)	Swamp Area (km^2)	Pond Area (km^2)	Basin Perimeter (km)	Total Length of Stream (km)	Stream Gradient (%)	Period of Record
01CC002	37.40	14.80	22.00	0.30	0.316	33.40	25.00	0.24	1967-PRESENT
01CC003	4.40	0.70	3.70	0.0	0.015	8.00	2.30	0.46	1968-PRESENT

In addition, the Water Quality Branch, Inland Waters Directorate, Environment Canada, Moncton, New Brunswick also maintains somewhat limited data associated with the following studies:

- P.E.I. Groundwater Study (May 1972 - September 1973);
- P.E.I. Surface Water Quality Survey (July 1972);
- Water Quality Board National Water Quality Monitoring (April 1974 - March 1978); and the
- Toxic Chemical Survey (1985).

Parameters monitored included the following: major ions, physical parameters, nutrients, metals and toxic substances.

10.2 City of Charlottetown Water Supply

Most of Prince Edward Island's domestic, municipal and industrial water supply is sourced from groundwater. The bulk of this water for the City of Charlottetown (located within the Hillsborough River Watershed Complex) and most of her surrounding municipalities comes from the Winter River Basin (located in the Tracadie Bay Watershed Complex). The primary effect of water withdrawal from the well fields at Union and Brackley (Map 11L/6) is the reduction of baseflow and streamflow. Baseflow reduction influences the amount of surface water available for other users including; anglers, aquaculture operations, recreational activities, agricultural users (stock watering and irrigation) and wildlife.

In order to avoid detrimental effects of groundwater withdrawal on users of surface water resources and to meet the increasing water demands for Charlottetown and area additional wells should be developed (Francis, 1989).

10.3 The Greater Charlottetown Environmental District Plan

The Charlottetown Area Regional Planning Board began to formalize regional planning by 1974. This was initiated mainly due to the Charlottetown Airport expansion proposal. The Greater Charlottetown Environmental District Plan (G.C.E.D.P.) set six goals:

1. to maintain the quantity and quality of surface water and groundwater supplies;
2. to optimize short and long te.n development costs;
3. to ensure protection of the Charlottetown area from airport development;
4. to provide for recreational development;
5. to encourage wildlife conservation; and
6. to ensure efficiency and accountability in the development application process.

Related to the first goal are the following objectives which are to support it:

1. to protect and maintain the quality of surface water;
2. to limit soil losses due to erosion;
3. to maintain local infiltration of runoff;
4. to observe safe rates of groundwater withdrawal;
5. to ensure effective waste management; and
6. to make provisions for special programs and remedial measures should they be required.

The G.C.E.D.P. is currently being updated in order to monitor industrial development near the airport. The control of noise pollution and the protection of the water supply in the Winter River district are also being examnined (Leach, 1989).

10.4 Charlottetown Airport Expansion Study

In the late 1970's a study was undertaken in order to measure the impacts of expanding versus relocating the Charlottetown Airport (Miller and Associates, 1978). The airport was eventually expanded and now encompasses an area which overlaps the southwest corner of the Tracadie Bay Watershed Complex (Map 11L/6). The headwaters of the Winter River were most susceptible to adverse effects during the construction phase of the expansion (Wrights Creek, which drains into the Hillsborough River, was also somewhat affected).

The objectives of the study were as follows:

1. to present an existing overview of the ecology and sociology of P.E.I., as well as, to document existing environmental conditions of the proposed sites;
2. to study the environmental impact which may result due to the construction and operation of the new airport facilities; and
3. to devise and recommend procedures to minimize or avoid adverse effects of the project.

Related to the airport expansion is a plan which monitors land-use practices adjacent to the airport. This plan was discussed in detail in section 10.3.

11.0 ACTIVITIES AFFECTING SURFACE WATER RESOURCES WITHIN THE TRACADIE BAY WATERSHED COMPLEX

Many of the problems affecting surface water resources within the Tracadie Bay Watershed Complex occur as a result of the high erodibility of Island soils. Soil erosion is accelerated by poor agricultural, forestry and road maintenance and construction practices. The problems affecting surface water resources on P.E.I. can be placed into three general categories; sedimentation (siltation) sources, pollution point sources and instream obstructions.

11.1 Sedimentation (Siltation) Sources

The entry of soil into surface waterways is described by the Watershed Inventory Project as a sedimentation (siltation) source. Autumn tillage, particularly plowing with the slope and cultivation excessively close to the streams' edge results in extensive landwash and siltation of the Island's waterways. Improper forestry operations, such as clearcutting on steep slopes and removal of greenbelts along streams and rivers also provides for sedimentation of streams and rivers.

One of the major sources of siltation to Island waterways is caused by the construction and maintenance of P.E.I. roads. Many roads on the Island are unpaved which, therefore, present numerous potential sources of sedimentation. Improper grading of these roads, in particular, leaving a ridge of clay and sand at either edge allows runoff water to form channels resulting in erosion to the road surface. Water usually flows alongside these ridges until it "breaks" through, often at a road-stream intersection. This practice of grading also renders ditches, if present, useless.

Silt-loading of Island streams and rivers does not usually affect the waterway at the point of entry but its effects are impacted further downstream. Soil particles are carried by currents and deposited in the stream covering essential finfish spawning areas. Shellfish beds in the estuaries are also affected in that they are smothered by silt.

11.1.1 Trout River I

The unpaved road crossing a stream feeding Little Deroche Pond is a siltation source to the Trout River (Map 11L/7).

11.1.2 Trout River II

Silt from an unpaved road is entering the Trout River (Map 11L/7).

11.1.3 Winter River

An unseeded area situated adjacent to a pond and bypass channel constitutes a sedimentation source to a section of the Winter River (Map 11L/6).

11.2 Pollution Point Sources

The entry of non-natural substances into a surface waterway is known as a pollution point source. For example, fertilizer and manure runoff into surface waterways results in bacterial and chemical contamination of the system. Inadequately or improperly treated human sewage, stormwater drainage and the discharge of industrial effluents also contribute to the deterioration of P.E.I.'s surface water quality.

The most recent examples of pollution point sources on the Island have been the entry of petroleum products, specifically gasoline, into streams, rivers and groundwater aquifers. This has resulted from either transportation accidents or leakage from underground storage tanks.

The result of bacterial contamination is usually the eutrophication of the aquatic system. As is the case with siltation the effects of many pollution point sources are felt in downstream areas. This can result in the closure of shellfish harvesting areas.

Although there were not any pollution point sources encountered within the Tracadie Bay Watershed Complex one can

assume that stock watering does occur on a limited basis. However, since the watershed contains the main domestic, municipal and industrial water supply for Charlottetown and area there are more stringent guidelines which restrict the possibility of water contamination.

11.3 Instream Obstructions

Numerous other factors also influence the quality of waterways within the Tracadie Bay Watershed Complex. Fallen trees or other debris in the streams and rivers present problems for fish passage. Improperly installed and unmaintained culverts, insufficient water flow and non-existent or inadequate dam bypass structures not only pose barriers to successful fish passage but also affect the amount of water available for use in downstream areas by other proponents.

11.3.1 Brackley Pumping Station

A build-up of natural debris on the upstream side of the culvert may present problems for successful fish passage through this section of the Winter River (Map 11L/6).

11.3.2 Brackley

A dam constructed of concrete blocks presents a total obstacle to fish passage on a section of the Winter River (Map 11L/6). A 0.28 metre plunge pool and a 0.30 metre high jump over a 0.50 metre wide barrier is not deep enough for successful passage to upstream locations.

11.3.3 Suffolk Station

A steep shallow bypass channel leading to a private pond creates a complete barrier to upstream fish travel on an unnamed stream draining into Officers Pond (Map 11L/6).

11.3.4 York I

A rail-stream intersection is a complete barrier to fish passage. The water depth of 0.02 metres within the 0.60 metre steel corrugated culvert is not sufficient for fish passage (Map 11L/6).

11.3.5 York II

This bypass channel is shallow and strewn with debris thereby rendering it impassable for fish. As well, the upper end of the channel has only a 0.41 metre deep plunge pool and a

jump of 1.30 metres (Map 11L/6).

11.3.6 Covehead Road

A 1.30 metre steel arched culvert with a wooden floor contains a water depth of less than 0.05 metres thereby presenting a total barrier to fish passage on this section of the Winter River (Map 11L/6). There is also a 0.15 metre jump from a plunge pool that has a depth of only 0.10 metres.

11.3.7 Pleasant Grove

A 1.75 metre steel arched culvert with a wooden floor contains a water depth of less than 0.05 metres on this unnamed tributary of the Winter River (Map 11L/6). The 0.10 metre jump from a plunge pool with a depth of 1.0 metre should not present any problems although the insufficient depth within the structure will.

11.3.8 Jimmy Angus Cove

The 1.30 metre steel arched culvert at a road-stream intersection has insufficient water depth (less than 0.05 metres) to pass fish successfully. The unnamed stream flows into Jimmy Angus Cove which is located in the southwestern section of Tracadie Bay (Map 11L/6).

11.3.9 Black River

The Black River is blocked by tree branches and other natural debris thereby constituting a barrier to fish passage (Map 11L/7).

11.3.10 Pipers Creek

A 1.30 metre road-stream crossing, located on Pipers Creek draining into Tracadie Bay (Map 11L/7), has little water flowing through it thereby constituting a complete barrier to fish passage.

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APPENDIX

APPENDIX A

TRACADIE BAY WATERSHED DAM INSPECTIONS

Type	Condition/Remarks	UTM Location
By-pass pond	No barrier - pond level approximately 3.0 metres from stream level (gradual slope to pond level).	495200 - 5132700
9-step pool and weir fishway	No barrier - fishway in good shape, large concrete spillway. Active sawmill near downstream entrance to fishway.	494900 - 5130700
5-step pool and weir fishway	No barrier - fishway in good shape, concrete spillway. There is also a corrugated metal drop inlet structure located nearby which is used for emergency drawdown purposes.	491200 - 5130800
Combination concrete - corrugated metal culvert	Upstream concrete arch - 0.60 water level - 0.50 metres downstream corrugated arch 0.74 metres, water level - 0.30 metres. There is a buildup of debris at upstream end which may cause passage problems later on (beaver signs were seen).	488500 - 5128900
Old Beaver Dam	No barrier - channel to pond is deep enough for fish passage. Angler at site caught a fish when we were there.	500000 - 5133300
By-pass pond	Complete barrier - very steep and shallow by-pass channel to pond level (no resting areas for fish throughout length of channel). Private pond with 7 Canada geese (clipped) on it.	495700 - 5129600
By-pass pond	Complete barrier - concrete blocks create a 0.50 metre wide barrier. Downstream plunge pool depth - 0.28 metre. Height of jump to pond level - 0.30 metre.	489400 - 5128000

Location	Condition/Remarks	UTM Coordinates
By-pass pond	Complete barrier - plunge pool depth - 0.41 metre, height of jump (1) - 0.60 metre, height of jump (2) - 0.70 metre. There is a 1.3 metre overall jump to pond level with an inadequate resting area after the first jump.	492000 - 5129600
1-step fishway of unknown type	No barrier - water level monitoring station (groundwater).	488600 - 5128900
By-pass pond	No barrier	488400 - 5128500
Rail-stream intersection (culvert)	Complete barrier - corrugated culvert - 0.60 metre, plunge pool (d/s) - 0.20 metre, water depth (culvert) - 0.02 metre. The culvert is raised above streambed which does not allow sufficient water to flow through to enable passage of fish.	492200 - 5129100
By-pass pond	No barrier - channel is not blocked and contains sufficient water to allow for fish passage.	501500 - 5132900